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PUERTO RICO DEPARTMENT OF
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WATER-RESOURCES INVESTIGATIONS REPORT 95-4166
Flood of October 6-7, 1985, Puerto Rico PLATE 2

FLOOD OF OCTOBER 6-7, 1985, IN THE PONCE-SANTA ISABEL AREA, PUERTO RICO

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FLOOD PROFILES

The flood profile shows the water-surface elevation referenced to a datum (normally mean sea level) and distance along a base line following the general flow direction. The profiles can be defined from actual high-water mark elevations or by computer analysis. Normally the profiles include the location and elevation of bridges, culverts, and other constraining structures along the channel.

Profiles for the Río Inabón, Río Jacaguas, Río Cañas, Río Descalabrado, and Río Coamo for the floods of October 5-10, 1970, and October 6-7, 1985, are shown in figures 3 through 7. Although the flood of 1985 was larger than the 1970 flood, in some areas the water-surface elevations were higher during the 1970 flood than during the 1985 flood. At the time of the 1970 flood, these areas were planted with sugarcane.

The profiles are referenced to an arbitrary base line shown on plates 1 and 2. The base line and, therefore, the profiles are not confined to the configuration of the channel, but follow a smoother path along the floodplain in the general direction of the flood flow. The profiles are based on high-water marks identified and surveyed shortly after the flood. Information was also obtained from residents in the study area. During the 1985 flood, the water surface was higher than the elevation of 8 of the 15 bridges in the flooded area (table 2; figs. 3 through 7). All elevations shown in the study area are referenced to mean sea level datum. Reference marks were established at selected points throughout the area (table 3) and are shown on plates 1 and 2.

FLOOD FREQUENCY

The relation of the annual-maximum discharge to the probability of occurrence is referred herein to as a flood-frequency relation. The recurrence interval, as applied to flood events, is the long-term average interval of time within which a given flood level or magnitude will be exceeded once. For example, a 100-year flood can be expected to occur on the average of once in a 100-year period. This does not mean floods occur at uniformly distributed time intervals: a flood with a 100-year recurrence interval can be exceeded more than once in the same year or can occur in consecutive years.

The flood-frequency relations for the Río Inabón at Real Abajo, Río Descalabrado near Los Llanos, and Río Coamo near Coamo were determined from long-term records. These flood-frequency relations were derived using the log-Pearson Type III distribution method (Interagency Advisory Committee on Water Data, 1982). The length of record for Río Jacaguas at Juana Díaz was insufficient to determine a flood-frequency relation using this methodology. Therefore, the method based on regional regression analysis for streams in Puerto Rico was used to derive a flood-frequency relation for Río Jacaguas at Juana Díaz (López and others, 1979). There are no historical records available for streams in the Río Cañas basin, therefore no flood-frequency analysis was developed for it.

The recurrence intervals for the maximum discharges of the October 1985 flood at the four streamflow-gaging stations in the affected area are shown in table 1. Table 1 also includes the recurrence intervals for the maximum discharges on record prior to October 1985. The recurrence interval of the October 1985 flood of the Río Inabón exceeded 100 years at the Real Abajo streamflow-gaging station and was 90 years at the Coamo streamflow-gaging station.

FLOODED AREAS

The October 6-7, 1985 flood was, with respect to area flooded, one of the largest ever recorded in the Ponce to Santa Isabel area. Floodwaters inundated large areas near the towns of Ponce, Juana Díaz, and Santa Isabel. In Ponce, the rural areas of Buyones, Calzada, Fortuna, and Tiburones were flooded. Water as deep as 2.0 m was recorded at Fortuna. Populated areas affected in Juana Díaz were Aguilita, Arús, Cuarto de Tierra, Galicias, Manzanillo, and Pastillo. The Arús housing area was the most affected, with as much as 2.0 meters of water observed in some houses. In Santa Isabel, the flooded areas were Descalabrado, Jauca, Paso Seco, Playa de Santa Isabel, Playita Cortada, and Velázquez. The flood was most severe in Paso Seco, where water reached depths of about 2.5 m.

The flood boundaries were delineated using the high-water marks and field inspection of the flooded area immediately after the flood. The boundaries are approximate and may not include areas where shallow flooding occurred.

WATER-SURFACE CONTOURS

Water-surface contours are based on the elevation of high-water marks surveyed after the October 6-7, 1985, flood. These contours represent equal elevations of the water surface and are perpendicular to the direction of flow. Obstructions to the flow, such as sugarcane fields, anthropogenic obstacles, and variations in valley width can affect the shape of the contours. The approximate depth of flooding at any point in the inundated area can be estimated by subtracting the ground elevation (contour) from the water-surface elevation (contour). Intermediate estimates of depth can be obtained by interpolation.

ADDITIONAL INFORMATION

Additional information related to this report can be obtained from the U.S. Geological Survey, Caribbean District, GSA Center, 651 Federal Drive, Suite 400-15, Guaynabo, Puerto Rico 00965 and copies of this report can be purchased from the U.S. Geological Survey, Earth Science Information Center, Open-File Reports Section, MS 517, Box 25286, Denver Federal Center, Denver, Colorado 80225.

REFERENCES

Haire, W.J., 1971, Floods in the Santa Isabel area, Puerto Rico: U.S. Geological Survey Hydrologic Investigations Atlas HA-448, 1 pl.

Interagency Advisory Committee on Water Data, 1982, Guidelines for determining flood flow frequency: Bulletin 17 B of the Hydrology Subcommittee: U.S. Geological Survey, Office of Water Data Coordination, Reston, Virginia.

López, M.A., Colón-Dieppa, Eloy, and Cobb, E.D., 1979, Floods in Puerto Rico, magnitude and frequency: U.S. Geological Survey Water-Resources Investigations Report 78-141, 68 p.

Quiñones, Ferdinand, and Johnson, K.G., 1987, The floods of May 17-18, 1985, and October 6-7, 1985, in Puerto Rico: U.S. Geological Survey Open-File Report 87-123, 20 p.

Table 2. Elevation data for bridges in flooded areas

Reference letter (see figs. 3-7 and plates 1 and 2 for location)	Distance along base line from mouth, in kilometers	Stream and bridge name	Elevation of low beam, in meters above mean sea level	Elevation of top of deck, in meters above mean sea level
		Río Inabón		
A	5.0	@ Highway 1	9.3	10.6
		Río Jacaguas		
B	3.2	@ Highway 1	11.9	13.1
C	4.1	@ Old railroad	12.3	12.8
D	7.5	@ Highway 510	26.8	28.6
		Río Cañas		
E	0.7	@ Highway 1	1.0	1.6
F	1.6	@ Highway 535	8.1	10.7
G	2.3	@ Old railroad	8.6	9.3
		Río Descalabrado		
H	1.5	@ Highway 1	7.8	9.4
I	2.4	@ Old railroad	14.8	15.4
J	2.8	@ Access road	15.4	16.0
K	3.7	@ Access road	17.3	17.4
		Río Coamo		
L	2.3	@ Highway 1	11.6	14.0
M	4.0	@ Old railroad[a]	17.2	17.8
N	7.2	@ Highway 545[b]	---	---
O	7.5	@ Highway 52[a]	51.3	53.3

a. Bridge partially destroyed during 1985 flood.
b. Bridge destroyed during 1985 flood.

Table 3. Reference marks established by the U.S. Geological Survey in the Ponce to Santa Isabel area, Puerto Rico

Reference mark number (see plates 1 and 2)	Elevation, in meters above mean sea level	Description
RM 1	10.81	USGS standard brass disk, set on downstream left abutment of bridge over the Río Inabón on Highway 1, 6.5 kilometers east of Ponce.
RM 2	26.84	Chiseled square, painted orange, set on top of upstream headwall of culvert over irrigation canal at Hacienda Fe, 0.5 kilometer west of Barrio Aguilita, Juana Díaz.
RM 3	13.16	USGS standard brass disk, set on sidewalk at left downstream side of bridge over the Río Jacaguas on Highway 1, west side of Barrio Arús, Juana Díaz.
RM 4	22.23	USGS standard brass disk, stamped *BM 52 B 1941*, set on top of downstream headwall of brick culvert on Highway 149, km 3.3, 3.5 kilometers south of Juana Díaz.
RM 5	4.20	USGS standard brass disk , set on downstream headwall of culvert on Highway 149, kilometer 0.2, north of intersection of Highway 1 and 149, at Barrio Capitanejo, Juana Díaz.
RM 6	8.58	USGS standard brass disk, set on downstream side of second pier from left abutment of railroad bridge over the Río Cañas at Hacienda Amelia, 6.5 kilometers southeast of Juana Díaz.
RM 7	15.36	USGS standard brass disk, set on downstream left abutment of railroad bridge over the Río Descalabrado, west of Highway 536 at Central Cortada, 4.7 kilometers northwest of Santa Isabel.
RM 8	6.61	USGS standard brass disk, set on left side of upstream headwall of culvert over Caño Torres on Highway 1, km 106.8, 3.1 kilometers northwest of Santa Isabel.
RM 9	39.24	USGS Standard brass disk, set on sidewalk in front of house number 28 on Highway 153, south of intersection with Highway 545 at Barrio Paso Seco, Coamo.
RM 10	20.48	USGS standard brass disk, set on sidewalk in front of entrance to Libby Inc. on Highway 153, km 2.3, 2.3 kilometer north of Santa Isabel.
RM 11	5.62	USGS standard brass disk, set on concrete slab between two flag poles in front of the Santa Isabel Police Department Station on Highway 538, Santa Isabel.
RM 12	7.14	Chiseled square, painted orange, set on left side of downstream headwall of culvert on Highway 1, 2.1 kilometer east of Santa Isabel.

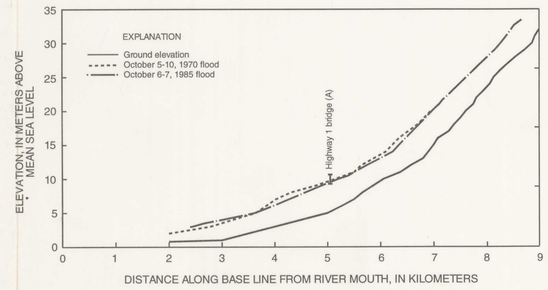

Figure 3. Flood profiles for the Río Inabón, Puerto Rico.

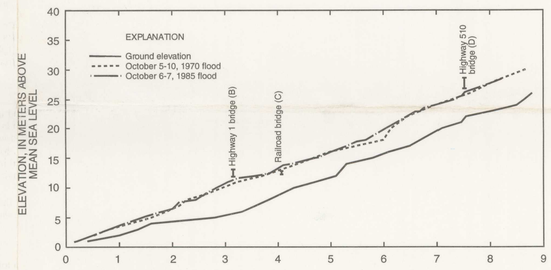

Figure 4. Flood profiles for the Río Jacaguas, Puerto Rico.

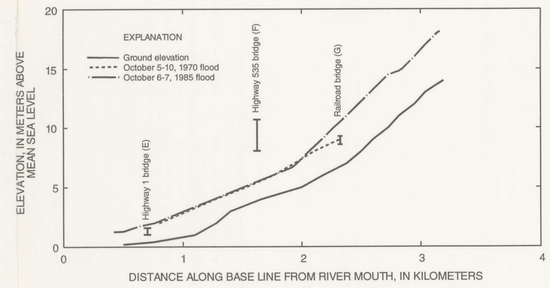

Figure 5. Flood profiles for the Río Cañas, Puerto Rico.

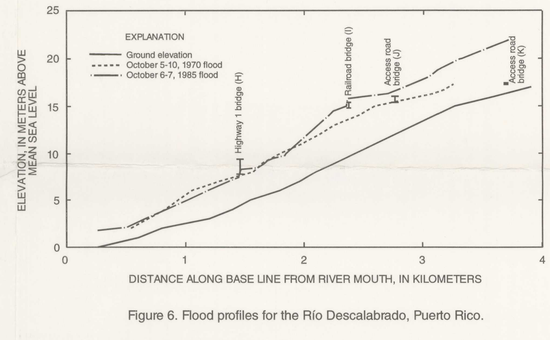

Figure 6. Flood profiles for the Río Descalabrado, Puerto Rico.

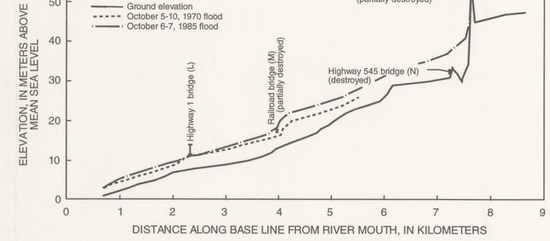

Figure 7. Flood profiles for the Río Coamo, Puerto Rico.

Base from U.S. Geological Survey Quadrangle, Santa Isabel, 1970, Salinas, 1970, Río Descalabrado, 1972, Coamo, 1972, Puerto Rico
Photorevised 1982. Lambert Conic Conformal Projection.

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